Southern Illinois University Carbondale
OpenSIUC

2006 Conference Proceedings

7-18-2006

Salinity Effects and Salt Movement from Surface Applied Gray Water and Brackish Water

Zhuping Sheng
Texas A & M University - College Station

Naomi Assadian
Texas A & M University - College Station

Abstracts of presentations given on Tuesday, 18 July 2006, in session 2 of the UCOWR Conference.

Salinity Effects and Salt Movement from Surface Applied Gray Water and Brackish Water

Zhuping Sheng and Naomi Assadian
Agricultural Research and Extension Center, El Paso
Texas Agricultural Experiment Station, The Texas A&M University System
1380 A&M Circle
El Paso, TX 79927

Abstract

In this paper authors present results of a soil column experiment on salinity effects and salt movement from surface applied gray water and brackish water. A total of 18 columns were constructed from polyvinyl chloride (PVC) with a diameter of 1 foot and a height of 3 ft, filled with loamy sand of the Hueco-Wink Association. Three moisture sensors were installed inside the column to monitor moisture changes at different depths. Soil amendments for the top 6 inch soil included no amendment, 2% organic mulch (on a dry weight basis), and 2% organic mulch with 15% CaO (hot lime). Irrigation scheduling and application volumes simulated practices for local cotton production that rely on 30 in (76 cm) of water per year or 5 inches (~13 cm) per irrigation cycle. Irrigation water was applied at a quantity of about 13.3 liters, representing an application of 5 inches (13 cm) with an additional leaching fraction of 40%, to each column every two weeks for six irrigation cycles. Leachate was captured after flooding soil columns. Once drainage ceased, the quantity of leachate was measured and aliquots were collected for chemical analyses.

The results indicated the soil salinity and sodicity may not be immediate issues when sandy soils receive gray water or brackish groundwater. Sandy soils have very low water holding capacities and low cation exchange capacities. The SAR of both water supplies exceeded 10, yet soil SAR after six irrigation cycles was less than 8 or typically less than 6 if the soil crust is excluded. Salt accumulation, particularly in surface soil was minimal (<2 dS m^{-1}) when a high leaching fraction was used for irrigation. Irrigation water rapidly infiltrated through the sandy desert soil and flushed salts. The quality of laundry and well sources significantly impacted vertical movement, drainage, and soil moisture retention. The infiltration and drainage of laundry water irrigation was significantly greater than that of well water. It appeared the cohesive water forces were stronger in laundry water rather than in water. In this study, soil conditioning affected the physical movement of water, soil moisture retention, the quality of leachate, and salinity and sodicity in soils. The impact was dependent on the interaction with irrigation source. As a consequence, the physical benefit of organic amendment to condition soil may depend on the chemical properties of the irrigation supply and of the soil conditioner. With well water irrigation, soil conditioning enhanced vertical movement and drainage as we hypothesized. Compost amendment and lime initially contributed to salinity, but ultimately reduced both salinity and sodicity with laundry water irrigation, but not with well water irrigation. The increase in soil sodicity with well water irrigation may be attributed to the exchange of Ca for Na on soil and mulch exchange sites.